

## ABSTRACT OF THE INVENTION

A conductive oxide solid formed through an electrochemical process. The resulting solid predominantly contains oxides of the highest oxidation state. Additionally, the solid can be thick, uniform, stable across a wide range of acidity and temperature, fully hydrated, and conductive with a very low redox potential. A preferred embodiment is an iridium oxide solid formed at high temperature in molten carbonate, said solid containing intercalated lithium. The solid has application as an electrode with reduced drift. An electrochemical acidity sensor is disclosed which pairs an electrode bearing the solid with a reference electrode. Additionally, sensor apparatuses for measuring carbon dioxide and other materials as well as methods for measuring materials using an embedded acidity sensor are disclosed.